A Publication of The College of Agriculture
UNIVERSITY OF CALIFORNIA

CALIFORNIA CANNED TOMATOES

ANALYSIS OF F.O.B. PRICE RELATIONSHIPS

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CALIFORNIA AGRICULTURAL EXPERIMENT STATION
GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS

Mimeographed Report No. 156 June 1953

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Introduction

In December, 1952, a report was issued which presented in considerable detail an account of the economic trends in the tomato industries.3/ That report was prepared to provide the growers, packers, distributors, and purchasers with economic and statistical information helpful in their planning and day-to-day operations. The report also was intended to make available background and to serve as a basis for the second part of an over-all study of the economics and marketing of canned tomatoes and products.

This report is presented as a progress account of the second part of the over-all study. Here we are concerned primarily with an economic-statistical analysis of the major factors which have tended to be related to the industry average f.o.b. prices received by packers of California canned tomatoes. Although other tomato products--such as canned tomato juice, paste and puree, sauces and soups, catsup and chili--are also major participants in the utilization of the California canning tomato crop, this report is oriented primarily to the analysis of f.o.b. price relationships for California canned tomatoes.

Attention is here directed to the price analysis of canned tomatoes because of their major position in the industry and also because of the relatively more available statistical data on canned tomatoes. For these reasons, canned tomatoes are a logical and convenient starting point in the analysis of the complex interrelationships among various products manufactured from

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3/ Hoos, Sidney, and Frank Meissner. California Canning Tomatoes, Economic Trends and Statistics. Berkeley, 1952. 41p. (Calif. Agr. Exp. Sta. Mimeo.) Processed.

Introduction

tomatoes. But other major tomato products must also be investigated in detail if an adequate account is to be developed of the pricing of tomatoes for canning and of canned tomatoes and products. This is clearly emphasized by examination of the economic trends and statistics presented in the December, 1952, report referred to earlier.

This second report can best be utilized in conjunction with the economic information and statistics in the earlier report, especially by those not fully familiar with the tomato industries. The materials presented here, however, are put so that, by themselves, they can be interpreted and used to advantage by those in the industry and trade who have a working knowledge of the economics of the tomato growing, canning, processing, and distributing industries.

Immediately below is presented a brief summary of the analyses and results developed from the investigation of factors related to the f.o.b. price of California canned tomatoes. The summary statement is followed by a more extended and detailed discussion of the economic-statistical price analysis, including interpretative comments. Then a descriptive account is given of the nature of the statistics developed for and used in various phases of the investigation. The report closes with a set of tables which include the statistical series on which the price analysis is based.

Summary

Canned tomatoes, in the trade, are considered to be a canned vegetable, one of the most important ones in terms of volume of pack and shipments. Most of the packers and distributors handling canned tomatoes also handle other canned vegetables. From the viewpoint of consumers, also, canned tomatoes are one of a number of canned vegetables. These relations of canned tomatoes to other canned products are significant since they bear on the trade and consumer demands for canned tomatoes.

The investigation in the relationships of canned tomato f.o.b. prices to the major influences affecting them considered the impacts of other canned vegetables. Recognition was also given to the possible impact of other canned tomato items on the demand for California canned tomatoes. Thus, it was necessary to develop an index of prices of competing tomato products and an index of competing canned vegetables. These indexes were used to measure the influences of those two groups of canned items related to the demand and consumption of canned tomatoes.

In addition to the factors noted in the preceding paragraph, the California packer shipments of canned tomatoes were considered in terms of their relation to the f.o.b. price of California canned tomatoes. Another factor considered was the volume of canned tomatoes packed in other states. These aspects will be noted in more detail below; they are mentioned here to indicate the nature of the various economic influences involved.

As a measure of purchasing power in terms of money and its impact on the demand for California canned tomatoes, an index of national disposable personal income was introduced. As the investigation progressed, it became evident that it was necessary for the analysis to consider the impact of the increased total demand for canned tomatoes related to population growth and changing consumer preferences.

This completes a brief indication of the major factors considered in the analysis. Various hypotheses were formulated, examined, and tested with the view of uncovering the major factors affecting the f.o.b. price of California canned tomatoes and its relation to such factors. The more important formulations will be discussed below. In this summary statement, we need only note that the formulation selected as the most promising so far is that the major factors affecting the f.o.b. price of California canned tomatoes include the following: the movement of canned tomatoes from California packers, the level

of national disposable personal income, competing canned vegetables whose influence is measured by an index of their prices, and a time trend reflecting the influences which have systematically and persistently occurred during the period analyzed and which have affected the demand for California canned tomatoes. The results of this formulation may be briefly indicated as follows:

A change of 10 per cent in the movement of canned tomatoes from California packers, considered by itself, was on the average associated with a change in the opposite direction of almost 1.5 per cent in the f.o.b. price of California canned tomatoes.

A change of 10 per cent in the index of national disposable income, considered by itself, was on the average associated with a change in the same direction of about 10 per cent in the f.o.b. price of California canned tomatoes.

A change of 10 per cent in the adjusted index of competing canned vegetable prices, considered by itself, was on the average associated with a change in the same direction of about 7 per cent in the f.o.b. price of California canned tomatoes.

The demand for California canned tomatoes on the average during the period analyzed tended to increase; if the shipments and other price-affecting factors had been kept constant, the f.o.b. price would have increased at the average rate of almost 1 per cent per year.

The f.o.b. price relationships summarized above reflect initial approximations to the true or actual relationships which may exist. The results developed must be further tested against market experience, and they must be carefully examined in light of their effectiveness as predictors of the f.o.b. price behavior before they can be viewed as firm relationships. Along with the testing and examination, better approximations may be developed with alternative

ings be put over another, better alternatives may be developed with the passing years. Long-run behavior before they can be viewed as true relationships. Using only the currently existing or legal or likely effectiveness or practices of the U.S. colonial wars or Eastern Central American experience, and the many be notions to the time or salary relationships which may vary. The results be- 1 per cent per year.

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The Soviet Air Differentials caused trouble on the entire in the U.S. price of California wheat harvest.

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A ratio of 10 per cent is the minimum level of acceptably price of California cannot tension.

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A change of 10 per cent is the index of national consumable the fact in the U.S. price ratio of California cannot tension.

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a change of 10 per cent in the movement of canned varieties

tions. The question of this formal plan may be briefly interplay a different project explored and which have affection the demand for California canned to- the relationship which more systematically overcome using the changes to a second in an index of "air price," and a time trend reflecting

formulations of the price behavior. As a basis for such progress, the price behavior investigated so far may be found helpful.

Economic-Statistical Price Analysis

At the outset, we must have a clear and precise understanding of what we mean by "demand." This is desirable because we shall consider some statistical evidence bearing on the demand question and also to clarify the essential relations between f.o.b. price and canner shipments of canned tomatoes.

We shall be concerned with market demand, the total demand of a large number of actual or potential buyers. It must be recognized that such market demand reflects, is based on, and is influenced by the demands of many individuals. The statistical evidence we shall consider reflects the group effects of many separate individuals with different tastes, preferences, incomes, and demand ideas. We shall view the market demand relations as the tendencies prevailing for the market group as a whole, although many of the individuals may have different tendencies.

The term "demand" is used widely and often loosely in marketing discussions. It is frequently used to mean the quantity of a product, say canned tomatoes, which has been sold or the market has taken. A more acceptable and useful interpretation refers to the relation between a schedule of prices and a corresponding schedule of quantities, both schedules pertaining to a particular product in a particular market. Hence, "demand" is representative of various quantities of a product that would be purchased at various corresponding prices in a given market, at a given time, and under given conditions. Those given conditions include fixed tastes and preferences of buyers or potential buyers, fixed amounts of income or money available for expenditures on all goods, and fixed prices of other goods and services. Thus, in a strict sense, the "demand" for a particular product pertains to some given situation in which all influences,

foundation of the price behavior. As a basis for such progress, the price behavior is investigated as it may be traced in detail.

<u>Economic-Statistical Price Analysis</u>

At the outset, we must have a clear and precise understanding of what we mean by "demand." This is desirable because we shall encounter such statistical evidence bearing on the second question and also to clarify the relationships between [illegible], price and demand statements of market behavior.

We shall be concerned with market demand, the total demand of a large number of actual or potential buyers. It must be recognized that such market demand, in reality, is based on, and is influenced by the demands of many individuals. The statistical evidence we shall consider reflects the joint effects of such separate individuals with different tastes, preferences, incomes, and [illegible]. We shall view the market demand relations as the tendencies prevailing for the market group as a whole, although many of the individuals may have different tendencies.

The term "demand" is used widely and often loosely in marketing literature. It is frequently used to mean the quantity of a commodity or product [illegible] which has been sold, or the market has taken. A more appropriate and accepted interpretation refers to the relation between a schedule of prices and a corresponding schedule of quantities, both schedules pertaining to a particular product in a particular market. Hence, "demand" is representative of various quantities of a product that would be purchased by consumers corresponding to prices for a given product at a given time, and under given conditions. These given conditions include fixed tastes and preferences of buyers, or potential buyers, fixed amounts of income or assets available for expenditure on the commodity and fixed prices of other goods and services. Thus, in a strict sense, the "demand" for a particular product is definable for each given situation in which all [illegible]

except price and quantity of the particular commodity, are given and fixed. In such a context it can be argued that, for a given demand, price and quantity of the particular commodity vary inversely; the lower the price, the larger the quantity that would be taken; the higher the price, the smaller the quantity that would be taken. Demand situations may be described in terms of mathematical equations, expressed as schedules in tabular form, or graphically pictured as demand curves. Always in the background of such demand curves, however, and influencing their shape and position are the given conditions such as income and tastes of the buyers, prices of other products, and the characteristics of the particular market.

When considering many problems in marketing, the nature of the demand is of crucial importance. And this is so for two reasons. First, there is the question as to how changes in quantity and changes in price are related for a given tomato demand situation, represented by its corresponding demand schedule or demand curve. Second, there is the question as to how the demand schedule as a whole responds to changes in the level of factors such as income.

The relations between price changes and quantity changes for a given demand schedule are expressed by the phrase "elasticity of demand with respect to price" which we shall call "price elasticity."[4/] The purpose of price elasticity

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4/ Price elasticity equals the percentage change in quantity divided by the corresponding percentage change in price. When the absolute value of the price elasticity is greater than 1, the demand is said to be "elastic" at the price-quantity combination at that point; when the absolute value of the price elasticity is less than 1, the demand is said to be "inelastic" at that point; and when the price elasticity is equal to 1, the demand is said to be of "unit elasticity." When the demand is elastic at a given price-quantity combination on the demand schedule, a small decline in price results in an increase in total money revenue from sales; but when the demand is inelastic at a given price-quantity point, a small decline in price results in a decrease in total money revenue from sales.

If price is the dependent variable, for statistical reasons it is more appropriate to use an elasticity measure which is the inverse of the price elasticity. This other measure is referred to as "price flexibility" and is equal to the relative change in price divided by the corresponding relative change in quantity.

is to measure the responsiveness of purchases to price changes, and it is computed so that its magnitude indicates the behavior of total money returns from sales as they are increased or decreased. Such effects of quantity changes on total revenue explain why it helps to have indications of the price-elasticity coefficients when considering marketing practices. With knowledge about the values of the price elasticities, one may draw inferences as to the money effects associated with the marketings of different quantities. For that reason, we shall later review the available statistical evidence bearing upon the price-elasticity coefficients for canned tomatoes.

Factors affecting the demand for canned tomatoes such as income do not remain constant; they change from year to year and sometimes vary widely. Such changes affect the position or level of the demand for canned tomatoes, and, as the changes occur, the demand schedule shifts. For that reason, the demand-affecting factors are often referred to as "shift variables." Such "shift variables" are included in statistical analyses of factors affecting demand and prices. Consideration of the "shift variables" is necessary to estimate the demand or net relation between f.o.b. price and shipments in a given season. They are also needed to estimate how and why the demand schedule shifts position from season to season or over a period of years. The available statistical evidence on the influence of major shift variables will be reviewed later.

It may be noted that the statistical price analysis explains the behavior of the seasonal f.o.b. prices of California canned tomatoes, in a statistical sense, in terms of the behavior of other influences. These influences might seem to be obvious, but in fact they are not always self-evident. Often it is not easy to uncover the statistical evidence which would support the importance of a certain influence. The choice of price-affecting factors included

in the statistical price analysis should be reasonably adequately acceptable from the combined views of economics, statistics, and marketing.

We are now ready to sketch the various factors considered in the price analysis. Figure 1 shows the canners' shipments and f.o.b. prices of California canned tomatoes since the 1926-27 marketing year. The war years are omitted from the analysis because of the abnormal conditions prevailing then such as price control and unusually large purchases by government agencies.

The annual f.o.b. prices fluctuated during the prewar years, but there is apparent a downward trend. The postwar prices have been at a much higher level than in previous years, reflecting the inflationary impacts evident in the prices of most products. Canner shipments from California fluctuated very widely in the prewar years. Wartime demands, evident as early as in 1940-41 because of military and lend-lease purchases, brought forth record shipments in 1940-41. They continued high during the war years and on through the post-war years.

From Figure 1 there appears to be no systematic relation between f.o.b. price and canner shipments other than the long-term trends. The year-to-year changes in the series seem to occur somewhat independently. To the extent that is so, it may be in large part because of the impacts and interactions of other influences related to and bearing on the price and shipments.

One influence which can be expected to bear upon the demand for canned tomatoes is the level of national income. This factor can be viewed as a shift variable since in response to its changes the demand for canned tomatoes shifts. The behavior over time of national income is reflected by the index of United States disposable personal income shown in Figure 2. The familiar course of general business conditions is evident in the figure. The rise to the 1929 prewar peak, the depression of the early 1930's with the low point in 1932-33, and then a gradual but slow recovery through the latter half of

FIGURE 1

California Canned Tomatoes, Canner Shipments and F.O.B. Price

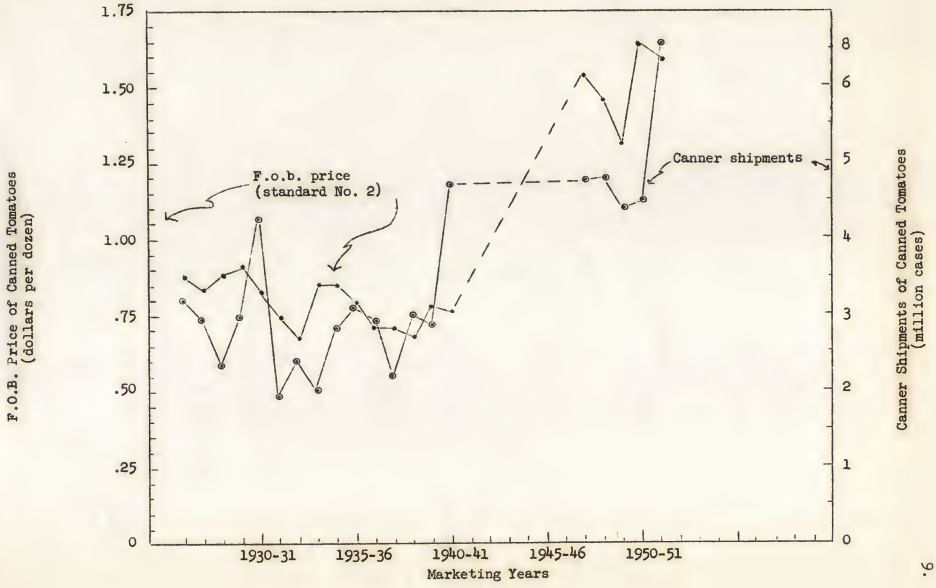
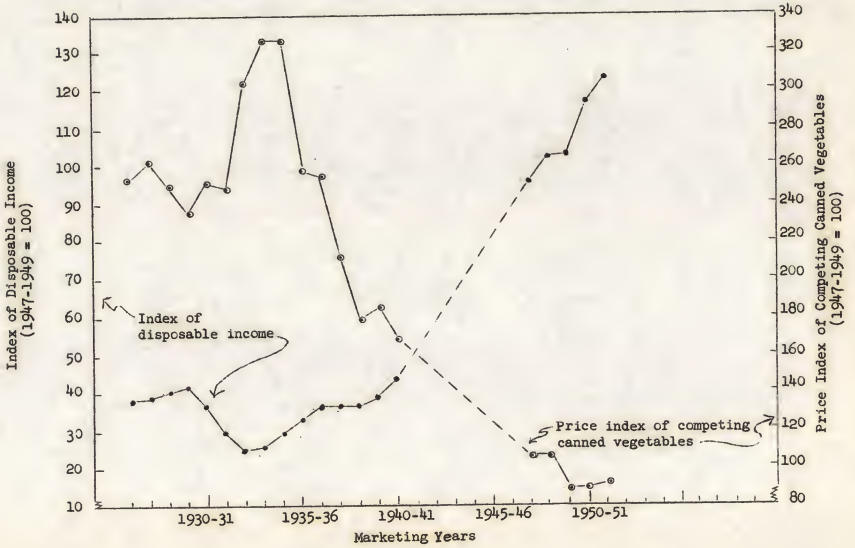


FIGURE 2

Indexes of Disposable Income and Prices of Competing Canned Vegetables



the 1930's were followed by accelerated improvement as the war years approached. During the postwar years, the index continued to climb each year, setting a new record in dollar terms if not in real or purchasing-power terms.

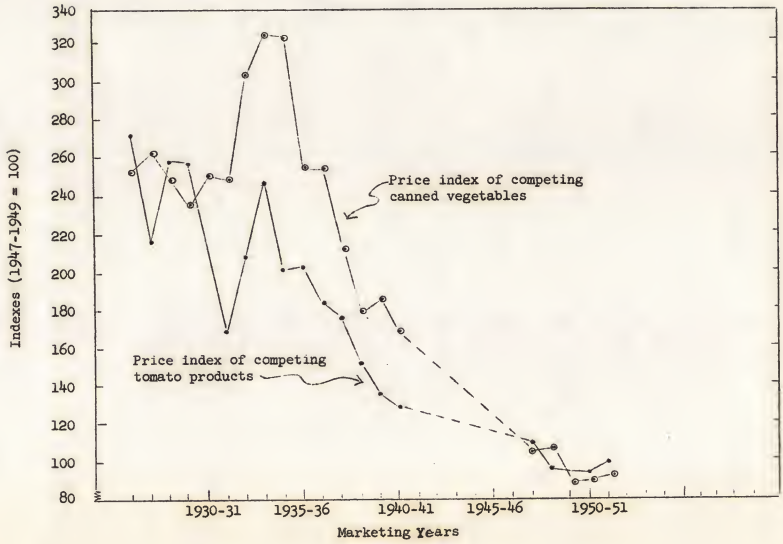
Figure 2 shows the behavior over time of the price index of competing canned vegetables. In the course of the analysis, the question arose as to whether the prices of other leading canned vegetables affected the demand for California canned tomatoes. For evidence on the question, the price index was constructed for use in the analysis. Since the early 1930's, the price index of competing canned vegetables followed a downward trend, indicating that in relative terms the competing vegetables have tended to underprice or sell at lower prices than canned tomatoes. But that trend may have been reversed in 1950-51. The construction of the price index of competing vegetables is explained in some detail in Table 4 and in the section on Data. Here it may be noted that the so-called competing vegetables include canned green stringless beans, canned green peas, and canned corn.

The price index of tomato products was constructed and introduced into the analysis in an attempt to measure the impact of the prices of other tomato products on the demand and prices of canned tomatoes. The index includes tomato juice, puree, paste, and sauce; catsup was considered for inclusion, but its price behavior as compared with the other products suggested that it had no appreciable competitive demand relation with canned tomatoes. The prices of the several tomato products--juice, puree, paste, and sauce--were weighted by their corresponding seasonal shipments in construction of the index, and 1947-1949 was used as the base period as in the other indexes considered in the analysis.

In Figure 3 are shown together the price index of competing canned vegetables and the price index of tomato products. The two indexes are put side by side so that it may easily be seen how they compare. Although the year-to-

FIGURE 3

Price Indexes of Competing Canned Vegetables and Competing Tomato Products



year changes are not wholly similar, the general drift and behavior of the two indexes are somewhat similar. Both indexes reflect the tendency for the prices of the canned vegetables and the prices of the tomato products in relative terms as they are reflected in the indexes to decrease over the years and become more competitive with respect to canned tomatoes. During the several recent years, however, that tendency appears to have been reversed.

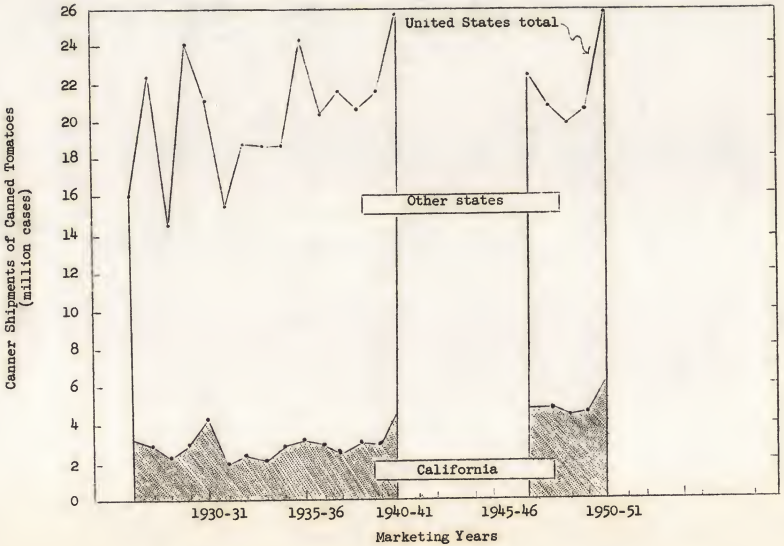
The fact that both indexes in Figure 3 behave somewhat similarly introduces a difficulty in the analysis. In a statistical sense, there is a difficulty in disentangling the effects of both indexes on the demand and price of canned tomatoes. Either of the two indexes reflects some of the impact of the other index as well as its own influence. Although later it will be noted that the price index of competing canned vegetables was selected for inclusion in the analysis, the tomato products cannot be deemed as having no influence on the price and demand for canned tomatoes.

Since other states pack and ship a large volume of canned tomatoes, the shipments from states other than California were considered from the view of their impact on the demand and price of California canned tomatoes. The national shipments, broken down into those from California and those from other states, are shown in Figure 4. The shipments from California and other states, respectively, behave somewhat similarly, although in some years there are noticeable differences. The correlation between the two series again introduces a difficulty in disentangling the partial or net effects of each and measuring each separately.

The variables whose statistical series were sketched in the preceding paragraphs were considered in terms of selecting a combination of variables so that the behavior of the prices of California canned tomatoes could be explained, in a statistical sense, in terms of the behavior of other variables. Thus, the California f.o.b. price was related to California shipments, those from other

FIGURE 4

Canner Shipments of Canned Tomatoes



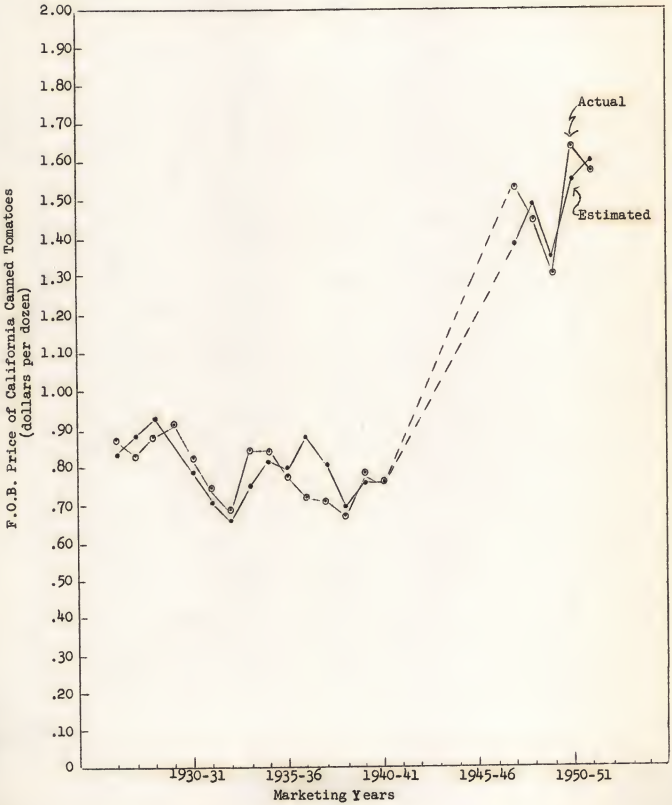
states, national disposable income, the index of competing canned vegetables, the index of competing tomato products, and a time trend reflecting the smooth shift over time in the demand for California canned tomatoes as well as various combinations of those variables. The outcomes of the various formulations were judged from the view of acceptability in terms of economics, marketing, and statistical criteria.

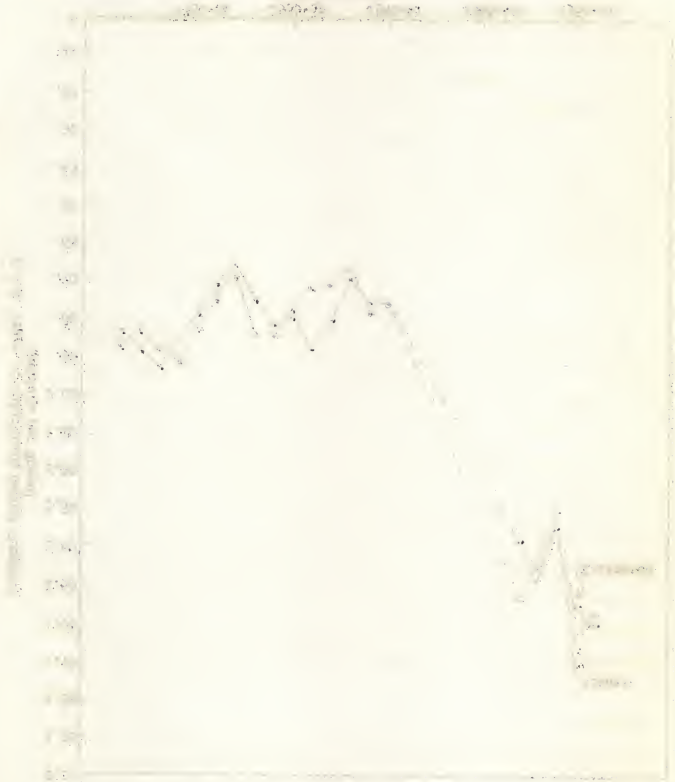
The statistical results of various formulations are summarized in Tables 7 and 8. Here it may be noted that Equation Number 3 in Table 8 was selected as the most acceptable formulation of those developed. The California f.o.b. price of canned tomatoes is expressed as a function of California canner shipments of canned tomatoes, national disposable income, the price index of competing canned vegetables, and a linear time trend. Although the prices of tomato products (other than canned tomatoes) and the shipments from other states (those besides California) probably do have an impact on the price and demand for California canned tomatoes, the inclusion of these two variables does not seem to improve the statistical results. Those two variables do not contribute in a significant way to the statistical explanation because it is believed that their influence is in large part already reflected in the other variables, prices of tomato products being reflected in considerable part in the prices of competing canned vegetables and the movement from other states being reflected in part by the shipments from California because of their intercorrelation.

With use of Equation Number 3 in Table 8, estimated f.o.b. prices of California canned tomatoes may be computed. Such estimated prices are charted in Figure 5 which also shows the actual prices. Although discrepancies, and in some years substantial ones, exist between the actual and estimated prices, the over-all patterns in the two-price series are substantially similar. In the prewar years, significant discrepancies exist for 1936-37 and 1937-38; the other

FIGURE 5

California Canned Tomatoes, Actual and Estimated F.O.B. Prices
(Dollars per dozen, standard No. 2)





prewar years are reasonably close together. In the postwar years, except for 1947-48, the actual and estimated prices correspond reasonably well. It is clear that the estimating equation is not a perfect predictor, but it does provide a basis for formulating judgment as to price behavior; and with the use of business judgment, the equation and its corresponding price relationships can contribute to a better understanding of the behavior of the f.o.b. price and its determinants.

What Equation Number 3 in Table 8 indicates may be verbally summarized in the following general terms as average relationships for the period from 1926-27 through 1951-52 but excluding the war years 1941-42 to 1946-47:

> A change of 10 per cent in the movement of California canned tomatoes, considered by itself, was on the average associated with a change in the opposite direction of almost 1.5 per cent in the f.o.b. price (standard No. 2) of California canned tomatoes.
>
> A change of 10 per cent in the index of United States disposable personal income, considered by itself, was on the average associated with a change in the same direction of about 10 per cent in the f.o.b. price (standard No. 2) of California canned tomatoes.
>
> A change of 10 per cent in the adjusted price index of competing canned vegetables, considered by itself, was on the average associated with a change in the same direction of about 7 per cent in the f.o.b. price (standard No. 2) of California canned tomatoes.
>
> The demand for California canned tomatoes, on the average during the period analyzed, tended to increase; if the shipments and other price-affecting factors had been kept constant, the f.o.b. price (standard No. 2) of California canned tomatoes would have increased at the average rate of almost 1 per cent per year.

The estimated net or partial relation of the f.o.b. price to California shipments of canned tomatoes gives a basis for making inferrences about the effect of price changes and shipment changes on the gross money revenue from canner shipments of California canned tomatoes. Present indications suggest that the demand for California canned tomatoes at the f.o.b. level is elastic. When other price- or demand-affecting influences are kept constant, a decrease in price is associated with an increase in shipments. But the change in shipments is relatively greater, that is in percentage terms, than is the change in price. Thus, within the range of market experience and economic conditions reflected in the data, a decrease in the f.o.b. price along with a corresponding increase in shipments is associated with an increase in gross money returns (but not necessarily net money returns) from the shipments of California canned tomatoes. This, however, does not mean that canners' demand for canning tomatoes need be elastic so that larger tonnages of tomatoes for canning would yield California growers increased total gross money returns. The nature of canners' demand for California canning tomatoes has not been investigated; this report is concerned only with the f.o.b. price relations of and the demand for California canned tomatoes at the f.o.b. level of the production-marketing process.

Data

In view of the experience encountered in the review and compilation of data for use in the investigation of f.o.b. price relationships of California canned tomatoes, it may be worth while to note a brief account of the data. Although the sources of the data and a description of them are noted in the tables appended to this report, the following supplementary comments will help to amplify such information.

to supply such information.

Notice obtained by this method, the forwarding supplement returned will indicate the cause of the delay and a description of the new address to which the publication should be sent. Publishers should note a partial extension of time was noted in this column, in which case the publication should be sent to the new address.

In view of the considerations mentioned in the preceding paragraph, it is suggested that the following procedure be followed in connection with the handling of undeliverable second-class publications:

1. Undeliverable second-class publications may not be returned to the sender unless the sender has requested such return on the publication or has guaranteed payment of return postage. Publishers desiring undeliverable second-class publications returned should request such return on the publication. Publishers desiring undeliverable second-class publications destroyed should request such destruction on the publication. Publishers desiring undeliverable second-class publications returned to them for disposition should request such return on the publication.

2. Undeliverable second-class publications not returned to the sender should be disposed of by the addressee in accordance with the instructions on the publication. If the publication is refused and the addressee is unwilling to dispose of it, the publication should be returned to the sender with the notation "Refused" and the date of refusal entered thereon.

3. Undeliverable second-class publications not returned to the sender should be disposed of by the addressee in accordance with the instructions on the publication. If the publication is refused and the addressee is unwilling to dispose of it, the publication should be returned to the sender with the notation "Refused" and the date of refusal entered thereon.

One of the first problems was the specification of the two indexes of competing commodities. In the case of canned vegetables, preliminary investigation indicated that canned corn, green stringless beans, and green peas were commodities competing with canned tomatoes. The decision as to what products should be included in the index of prices of competing canned tomato products was not quite as clear cut. Desiring to reflect the competition between canned tomatoes and tomato products on the consumption side rather than on the utilization side of the raw tomatoes, tomato juice, puree, paste, and sauce were included in the index of competing tomato products.

The f.o.b. prices of canned tomatoes used in the analyses are based on quotations published in the California Fruit News and are for the size and grade, standard No. 2, f.o.b. California. Although recently a marked growth of the 303 size can and an increase in importance of "fancy" grades has taken place over the years, the standard No. 2 has been the most important indicator of the canned tomato price level.

The first of numerous problems in the analysis because of the seemingly unavailability of data arose in obtaining statistics on the movement of canned tomatoes from canners' hands. The figures finally used are as follows: for the years 1926-27 through 1930-31--the annual packs as compiled by the Canners League of California; for the years 1931-32 through 1937-38--the annual shipments from California canners as compiled by the Canners League of California; and for the years 1938-39 through 1951-52--the annual shipments as reported in National Canners Association's informational bulletins. The movement figures for the early years are unavailable.

Although it would be preferable to have the pack and shipment data in some sort of standard units, such as 24 No. 2, such data are not available. Hence it was necessary to use shipment data expressed in terms of actual cases. The same applies to the pack and movement data of the tomato products.

The index of national income used is based on statistics compiled and issued by the U. S. Department of Commerce. For the years beginning 1926-27 and ending 1928-29, the figures used in the index are the average of the calendar year nonagricultural net income payments as reported in The Farm Income Situation of the U. S. Bureau of Agricultural Economics. For the years beginning 1929-30, the index reflects United States disposable personal income developed and issued by the U. S. Department of Commerce. The income data were put in index number form, using the average of 1947-1949 as the base period.

The level of competing canned vegetable prices has been measured by an index of prices of competing canned vegetables, including canned peas, green stringless beans, and yellow cream-style corn. The price series for each of the vegetables used in the index is based on f.o.b. cannery prices (f.o.b. eastern markets, e.g., Baltimore, Maryland, or eastern) as reported weekly in the Canning Trade. Although a fairly complete series for each was available, one year for beans, four years for corn, and thirteen years for peas had to be estimated by use of Wholesale Prices of these commodities, compiled and issued by the U. S. Bureau of Labor Statistics. The can size for all these quotations is No. 2. The grade is "standard" for beans and corn and "fancy" for peas. The prices of the canned vegetables in the index have been weighted by the United States annual pack figures for the prewar years and the United States annual shipment figures for the postwar years. These pack and movement figures are on a basis of 24 No. 2 as compiled and issued by the National Canners Association. As is the case with all commodities used, the lack of data on annual carry-overs and shipments necessitated the use of pack figures as weights in the early years. The base period of this index is also 1947-1949.

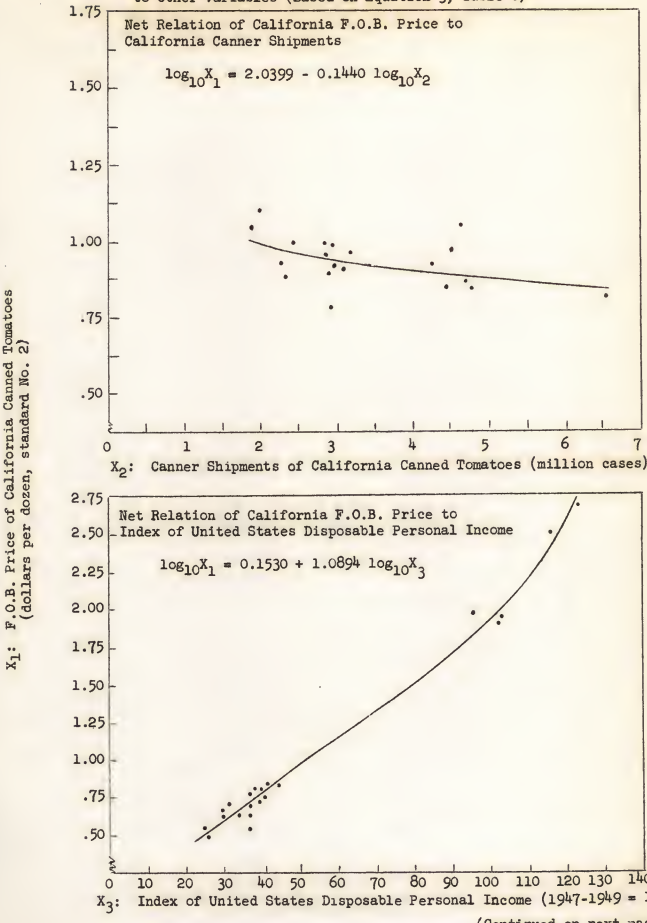
The level of prices of tomato products competing with canned tomatoes was measured by an index constructed to include tomato juice, puree, paste, and sauce. Here again there was the problem of lack of appropriate price data.

In the index constructed, the tomato juice and puree prices are the f.o.b. California cannery prices in the first week of January of the marketing year as reported in the California Fruit News. For juice, the prices for the first five years are estimated. The quotations for juice are on the basis of fancy No. 2, and those for puree are for standard No. 10. The prices for paste consist of estimates for years 1926-27 through 1930-31, and the prices for other years are based on quotations for the first week of January as reported in the Western Canner and Packer Yearbook and the Commercial Bulletin (6-ounce cans). The sauce prices are the opening prices for Del Monte 8-ounce cans as reported in the Calpak Annual. The complete details of the weights and sources used in this index are given in the appended tables. In general for weights of each of the products, it was necessary to use the annual California pack data for the prewar years and the annual shipments from California canneries for the postwar years. For the late 1920's, even pack data were not available for all years so estimates were developed for use as weights in the index. The main sources for the pack and movement data used as weights in the index are the Canners League of California and the National Canners Association with some data obtained from the Western Canner and Packer Yearbook and Statistical Number. Here again, pack and movement figures were not available on a standard basis such as 24 No. 2, so data in actual cases were used as weights in the index.

In addition to the sources noted above, other sources were investigated to learn of the existence of published data required for the analysis. Among the sources consulted but which did not provide continuous series of data or provided only limited information from the view of the analysis, the following publications are noted: reports published by the American Institute of Food Distribution; Canning Age; Producer Price Current; New York Journal of Commerce; and Canner.

FIGURE 6

Net Relations of California Canned Tomatoes F.O.B. Price to Other Variables (Based on Equation 3, Table 8)



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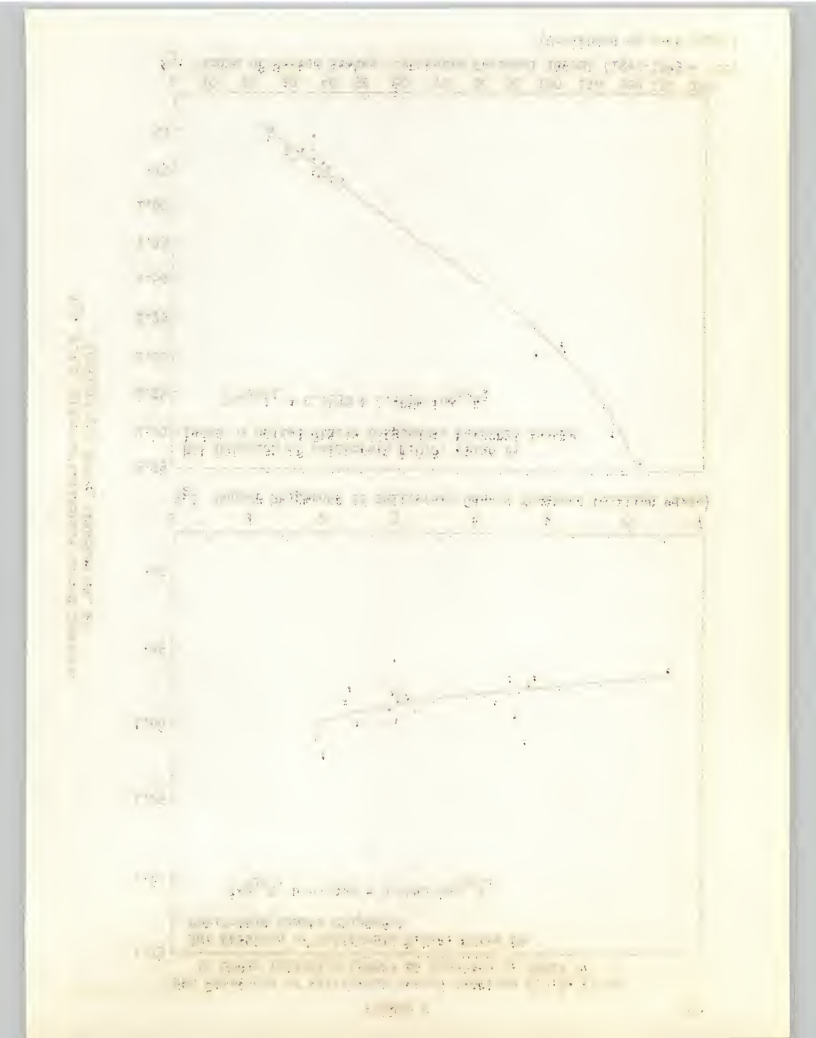
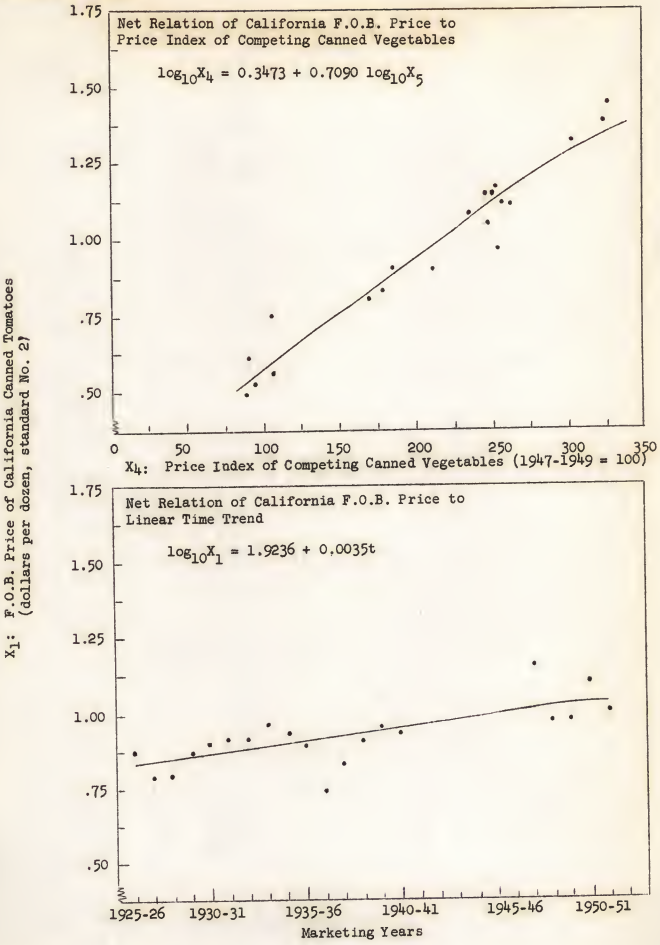


Figure 6 continued.



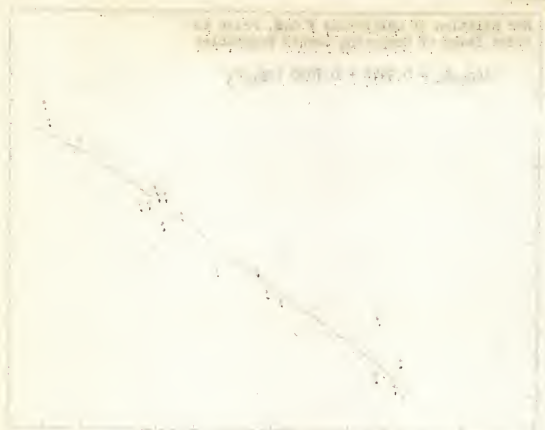


TABLE 1

F.O.B. Prices of California Canned Tomatoes and Related Economic Variables

Marketing year	F.o.b. prices of canned tomatoes (standard No. 2)	California canners' pack and movement, canned tomatoes	Index of United States disposable income	Price index of competing canned vegetables	Price index of competing tomato products	Other states' movements of canned tomatoes
	1	2	3	4	5	6
	dollars per dozen	millions of actual cases	1947-1949 = 100			millions of actual cases
1926-27	0.875	3.191	38.1	252.3	272.2	12.949
1927-28	0.838	2.914	38.3	262.1	218.7	19.511
1928-29	0.882	2.276	40.1	248.0	258.3	12.299
1929-30	0.914	2.945	41.7	235.7	257.5	21.201
1930-31	0.820	4.245	36.5	250.4	213.1	16.918
1931-32	0.743	1.912	29.6	247.9	167.6	13.603
1932-33	0.683	2.374	24.8	303.2	207.3	16.482
1933-34	0.852	2.029	25.9	326.6	248.8	16.688
1934-35	0.852	2.834	29.3	324.9	200.4	15.882
1935-36	0.769	3.101	33.2	257.0	202.4	21.096
1936-37	0.721	2.936	36.7	253.4	183.1	17.375
1937-38	0.714	2.371	36.5	211.2	176.6	19.130
1938-39	0.673	2.994	36.3	178.0	151.3	17.689
1939-40	0.773	2.855	38.7	184.2	135.7	18.743
1940-41	0.758	4.696	43.8	167.2	128.2	21.195
(War years)						
1947-48	1.536	4.638	95.6	105.8	110.1	17.762
1948-49	1.455	4.786	102.1	106.2	96.3	15.912
1949-50	1.306	4.411	102.3	88.4	94.3	15.313
1950-51	1.638	4.503	116.4	88.7	84.1	16.034
1951-52	1.580	6.549	123.0	91.0	99.4	19.452

Sources:

Col. 1: California Fruit News. For years 1926-27 through 1940-41, week ending nearest the 15th of month; 1947-48 through 1949-50, first and third weeks of months; and 1950-51 and 1951-52, weekly prices. Marketing year, June 1-May 31.

Col. 2: For years 1926-27 through 1930-31, pack from Canners League of California. For years 1931-32 through 1937-38, shipments from Canners League of California. For years 1938-39 through 1951-52, shipments from National Canners Association. Marketing year, July 1-June 30.

Col. 3: See Table 4, column 4.

Col. 4: See Table 4 for sources and methods of construction.

Col. 5: See Table 6 for sources and methods of construction.

Col. 6: National Canners Assn. for 1926-27 to 1929-30 packs; California Packing Corp. for 1930-31 to 1951-52 movements.

TABLE 2

Actual and Estimated F.O.B. Prices of California Canned Tomatoes, Standard No. 2

Marketing year, June through May	Actual price	Estimated price	Difference: column 1 minus column 2	Percentage difference: column 3 as per cent of column 1
	1	2	3	4
	dollars per case, standard No. 2			per cent
1926-27	0.875	0.834	0.041	4.7
1927-28	0.838	0.881	-0.043	- 5.1
1928-29	0.882	0.930	-0.048	- 5.4
1929-30	0.914	0.909	0.005	0.5
1930-31	0.820	0.786	0.034	4.1
1931-32	0.743	0.702	0.041	5.5
1932-33	0.683	0.653	0.030	4.4
1933-34	0.852	0.744	0.108	12.7
1934-35	0.852	0,814	0.038	4.5
1935-36	0.769	0.786	-0.017	- 2.2
1936-37	0.721	0.882	-0.161	-22.3
1937-38	0.714	0.802	-0.088	-12.3
1938-39	0.673	0.688	-0.015	- 2.2
1939-40	0.773	0.768	0.005	0.6
1940-41	0.758	0.768	-0.010	- 1.3
(War years)				
1947-48	1.536	1.381	0.155	10.1
1948-49	1.455	1.493	-0.038	- 2.6
1949-50	1.306	1.340	-0.034	- 2.6
1950-51	1.638	1.554	0.084	5.1
1951-52	1.580	1.605	-0.025	- 1.6

Sources:

Col. 1: Table 1, column 1.

Col. 2: Estimated by use of data in Table 1 applied to equation 3 in Table 8.

TABLE 6

[illegible]
[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3

F.O.B. Prices and United States Packs and Canners' Shipments of Canned Vegetables

Marketing year	Prices of competing vegetables, f.o.b. eastern markets			United States packs and canner shipments		
	Corn, standard No. 2	Peas, fancy No. 2	Beans, standard No. 2	Corn	Peas	Beans
	1	2	3	4	5	6
	dollars per dozen			thousands of cases, 24 No. 2 basis		
1926-27	0.99	1.38	1.02	19,069	17,709	4,037
1927-28	1.08	1.33	1.18	10,347	12,936	4,677
1928-29	1.02	1.33	1.26	14,497	17,943	6,215
1929-30	1.03	1.43	0.97	17,487	18,530	8,525
1930-31	0.98	1.29	0.84	15,692	22,035	8,251
1931-32	0.69	1.29	0.64	19,415	13,286	6,067
1932-33	0.60	1.30	0.60	9,358	10,367	4,024
1933-34	0.75	1.37	0.71	10,193	12,893	5,532
1934-35	0.96	1.46	0.72	11,268	15,742	6,300
1935-36	0.77	1.36	0.69	21,471	24,699	7,161
1936-37	0.98	1.37	0.81	14,621	16,553	6,629
1937-38	0.73	1.25	0.66	23,541	23,467	10,052
1938-39	0.64	0.99	0.55	20,470	25,459	10,915
1939-40	0.70	1.13	0.63	14,567	16,074	8,487
1940-41	0.70	1.08	0.67	15,524	25,196	9,798
(War years)						
1947-48	1.11	1.35	1.15	26,167	30,197	14,303
1948-49	1.24	1.40	1.28	27,897	26,263	15,071
1949-50	0.97	1.20	1.12	27,409	26,011	19,237
1950-51	1.20	1.35	1.15	24,068	30,243	21,323
1951-52	1.40	1.41	1.19	25,544	30,788	18,522

(Continued on next page.)

| | | |

Table 3 continued.

Sources:

Col. 1: For years 1928-29 through 1951-52, except for 1937-38 and 1947-48, week ending nearest the 15th of the month as reported in Canning Trade. All other prices were estimated with use of U. S. Bureau of Labor Statistics, Wholesale Prices for corn. Marketing year, June 1-May 31.

Col. 2: For years 1935-36, 1938-39 to 1940-41, and 1947-48 and 1948-49, week ending nearest the 15th of the month as reported in Canning Trade. All other prices estimated with use of U. S. Bureau of Labor Statistics, Wholesale Prices for peas. Marketing year, June 1-May 31.

Col. 3: For years 1928-29 through 1951-52, week ending nearest the 15th of the month as reported in Canning Trade. For years 1926-27 and 1927-28, estimated with use of U. S. Bureau of Labor Statistics, Wholesale Prices for beans. Marketing year, June 1-May 31.

Cols. 4, 5, and 6: National Canners Association. For years 1926-27 through 1940-41, packs as taken from National Canners Association Canned Food Pack Statistics, 1951. For years 1947-48 through 1951-52, movements from National Canners Association as recorded by California Packing Corporation. Marketing year: for corn, August 1-July 31; for peas, June 1-May 31; and for beans, July 1-June 30.

TABLE 4

Construction of Index of Prices of
Canned Vegetables Competing with Canned Tomatoes

Marketing year	Weighted average prices of competing canned vegetables		United States disposable income		Index of competing canned vegetable prices
	Dollars per case	Relatives, 1947-1949=100	Billions of dollars	Index, 1947-1949=100	1947-1949=100
	1	2	3	4	5
1926-27	1.1607	96.12	71.3	38.1	252.3
1927-28	1.2120	100.37	71.6	38.3	262.1
1928-29	1.2010	99.46	75.1	40.1	248.0
1929-30	1.1866	98.27	78.1	41.7	235.7
1930-31	1.1036	91.40	68.4	36.5	250.4
1931-32	0.8860	73.37	55.4	29.6	247.9
1932-33	0.9080	75.20	46.5	24.8	303.2
1933-34	1.0214	84.59	48.4	25.9	326.6
1934-35	1.1494	95.19	54.8	29.3	324.9
1935-36	1.0302	85.32	62.1	33.2	257.0
1936-37	1.1227	92.98	68.6	36.7	253.4
1937-38	0.9306	77.07	68.3	36.5	211.2
1938-39	0.7804	64.63	67.9	36.3	178.0
1939-40	0.8609	71.30	72.4	38.7	184.2
1940-41	0.8843	73.23	82.0	43.8	167.2
(War years)					
1947-48	1.2212	101.13	178.9	95.6	105.8
1948-49	1.3096	108.46	191.1	102.1	106.2
1949-50	1.0918	90.42	191.5	102.3	88.4
1950-51	1.2460	103.19	217.8	116.4	88.7
1951-52	1.3516	111.93	230.2	123.0	91.0

Sources:

Col. 1: Canned vegetable prices weighted by their corresponding packs and shipments. F.o.b. prices given in Table 3 and weighted by their corresponding packs and domestic movements given in Table 3.

Col. 2: Column 1 figures expressed as percentages with 1947-1949=100.

Col. 3: For years 1926-27 through 1928-29, average of calendar year figures for nonagricultural net income as adjusted from U. S. Department of Commerce estimates and as reported in U. S. Bureau of Agricultural Economics, The Farm Income Situation, December, 1952-January, 1953. For years, 1929-30 through 1951-52, disposable personal income as reported in U. S. Department of Commerce, Office of Business Economics, Survey of Current Business.

Col. 4: Column 3 figures expressed as percentages with 1947-1949=100.

Col. 5: Column 2 as per cent of column 4.

Table 3

Classification of Imports and Exports of
Selected Major Countries, 1937 (Percent Distribution)

Classification	Imports			Exports		
	Germany	United States	United Kingdom	Germany	United States	United Kingdom
Foodstuffs	17.2	10.0	30.1	2.1	3.1	1.3
Raw materials	29.2	31.0	29.1	2.1	11.1	2.1
Semi-manufactures	19.1	15.0	11.1	15.1	15.1	11.1
Finished manufactures	11.1	11.1	11.1	11.1	11.1	11.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
(Per cent)						
Agriculture	11.1	11.1	11.1	11.1	11.1	11.1
Mining	11.1	11.1	11.1	11.1	11.1	11.1
Manufacturing	11.1	11.1	11.1	11.1	11.1	11.1
Trade	11.1	11.1	11.1	11.1	11.1	11.1
Services	11.1	11.1	11.1	11.1	11.1	11.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Sources:

Col. 1: Source 1 figures expressed as percentages of total imports.

Col. 2: Column 1 of Part Four of Section II.

Col. 3: Column 2 figures expressed as percentages of total imports.

Col. 4: For France 1929-37 Journal Officiel, Statistique et Législation pour l'année 1937 (Paris, 1938), pp. 1-2. For Germany 1929-37 Statistik des Deutschen Reichs, Bd. 451, Heft 1, Teil 1, Tabelle 1, pp. 1-2. For Italy 1929-37 Annuario Statistico Italiano, 1938, Vol. I, Parte Seconda, Tavola 1, pp. 1-2. For Japan 1929-37 Annual Returns of the Foreign Trade of the Empire of Japan, 1937, Vol. I, Table 1, pp. 1-2. For the United States 1929-37 Statistical Abstract of the United States, 1938, Table 1, p. 1. For the United Kingdom 1929-37 Statistical Abstract for the United Kingdom, 1929-37 (London, 1938), Table 1, p. 1.

Col. 5: Column 3 of Part Four of Section II.

Col. 6: Column 4 figures expressed as percentages of total exports.

TABLE 5

F.O.B. Prices and California Packs and Canners' Shipments of Tomato Products

Marketing year	Prices of competing tomato products, f.o.b. California				California packs and canners' shipments			
	Juice, fancy No. 2	Puree, standard No. 10	Paste, 6-ounce cans	Sauce, Del Monte 8-ounce cans	Juice	Puree	Paste	Sauce
	1	2	3	4	5	6	7	8
	dollars per dozen				thousands of actual cases			
1926-27	1.00[a]	3.35	0.50[a]	0.500	300[a]	297[a]	100[a]	350[a]
1927-28	0.95[a]	2.75	0.47[a]	0.450	325[a]	297	100[a]	350
1928-29	0.95[a]	3.50	0.45[a]	0.450	350[a]	475[b]	100[a]	560[b]
1929-30	0.95[a]	3.50[a]	0.45[a]	0.475	375[a]	652	100[a]	770
1930-31	0.95[a]	2.75	0.45[a]	0.475	400[a]	340[b]	100[a]	567[b]
1931-32	0.95	2.50	0.42	0.450	420	27	97	363
1932-33	0.80	2.00	0.36	0.375	599	378[b]	200	1,027[b]
1933-34	0.85	3.75	0.39	0.450	348	378[b]	245	1,690
1934-35	0.85	3.35	0.42	0.425	1,015	378[b]	517	1,449[b]
1935-36	0.75	3.00	0.42	0.400	1,153	729	810	1,207
1936-37	0.75	3.00	0.48	0.400	2,033	1,086	1,234	1,825
1937-38	0.725	2.85	0.46[c]	0.400	2,317	982	1,517	1,089
1938-39	0.725	2.75	0.39[c]	0.375	1,028	697	1,600	1,147
1939-40	0.75	3.00	0.39	0.400	1,246	463	1,125	1,588
1940-41	0.70	2.75	0.40	0.375	2,401	876	1,000	1,973
(War years)								
1947-48	1.025	6.65	0.64	0.615	5,544	1,905	3,876	3,078
1948-49	1.05	6.65	0.89	0.600	6,450	1,603	3,943	3,728
1949-50	1.025	6.10	0.89	0.600	6,436	1,751	3,716	4,620
1950-51	1.15	7.00[a]	0.90	0.600	7,122	1,578	3,435	5,445
1951-52	1.15	7.50	1.19	0.690	9,110	3,315	8,428	6,380

a/ Estimated by authors.
b/ Mean of nearest preceding and succeeding years.
c/ Estimated by S. W. Shear

(Continued on next page.)

Table 5 continued.

Sources:

Cols. 1, 2, 3, and 4: California Canners Prices (published f.o.b. quotations in 1st week of January of marketing year for all products except sauce for which prices are published opening prices). All foregoing prices are as reported by Hoos, Sidney, and Frank Meissner. California Canning Tomatoes, Economic Trends and Statistics. Berkeley, 1952. 41p. (Calif. Agr. Exp. Sta. Mimeo.) Processed.

Cols. 1 and 2: California Fruit News.

Col. 3: Western Canner and Packer Yearbook, 1937-1943, and Commercial Bulletin for 1943-1952.

Col. 4: Calpak Annual, 1938-1952.

Col. 5: For years 1931-32 to 1940-41, packs from Canners League of California. For years 1947-48 to 1951-52, shipments from National Canners Association as recorded by California Packing Corporation. Marketing year, July 1-June 30.

Col. 6: For years 1927-28, 1929-30, and 1931-32, pack from Western Canner and Packer Yearbook and Statistical Number, 1937. For years 1935-36 to 1940-41 and 1951-52, pack from Canners League of California. For years 1947-48 to 1950-51, shipments for marketing year (June 1-May 31) from Canners League of California.

Col. 7: Canners League of California. For years 1931-32 to 1940-41 and 1951-52 pack. For years 1947-48 to 1950-51, shipments for marketing year, June 1-May 31.

Col. 8: For years 1927-28, 1929-30, 1931-32, and 1933-34, pack from Western Canner and Packer Yearbook and Statistical Number, 1937. For years 1935-36 to 1940-41, pack from Canners League of California. For years 1947-48 to 1951-52, shipments for marketing year, June 1-May 31.

TABLE 6

Construction of Index of Prices of
Tomato Products Competing with Canned Tomatoes

Marketing year	Weighted average prices of competing tomato products		Index of United States disposable income, 1947-1949=100	Index of competing tomato product prices, 1947-1949=100
	Dollars per case	Relatives 1947-1949=100		
	1	2	3	4
1926-27	1.5430	103.72	38.1	272.2
1927-28	1.2458	83.75	38.3	218.7
1928-29	1.5410	103.59	40.1	258.3
1929-30	1.5973	107.37	41.7	257.5
1930-31	1.1570	77.78	36.5	213.1
1931-32	0.7382	49.62	29.6	167.6
1932-33	0.7647	51.40	24.8	207.3
1933-34	0.9586	64.44	25.9	248.8
1934-35	0.8735	58.72	29.3	200.4
1935-36	0.9997	67.20	33.2	202.4
1936-37	0.9995	67.19	36.7	183.1
1937-38	0.9589	64.46	36.5	176.6
1938-39	0.8172	54.93	36.3	151.3
1939-40	0.7815	52.53	38.7	135.7
1940-41	0.8350	56.13	43.8	128.2
(War years)				
1947-48	1.5663	105.29	95.6	110.1
1948-49	1.4620	98.28	102.1	96.3
1949-50	1.4346	96.43	102.3	94.3
1950-51	1.4560	97.88	116.4	84.1
1951-52	1.8186	122.25	123.0	99.4

Sources:

Col. 1: Canned tomato product prices weighted by their corresponding packs and shipments. F.o.b. prices given in Table 5 and weighted by their corresponding packs and domestic shipments given in Table 5.

Col. 2: Column 1 figures expressed as percentages with 1947-1949=100.

Col. 3: See Table 4, column 4.

Col. 4: Column 2 as per cent of column 4.

TABLE 7

California Canned Tomatoes
Multiple Regression (Least Squares) Equations and Auxiliary Statistics
(1926-27 to 1951-52, Excluding 1941-42 to 1946-47)

Equation number	Dependent variable	Constant	Independent variables[a/]						$\bar{R}$
			X_2	$\text{Log}_{10} X_3$	X_4	X_5	X_6	t	
			t-ratios in parentheses and beta coefficients in brackets						
1	X_1	-1.398124	-0.024991 (0.616741) [-0.090784]	1.473736 (6.926938) [1.019651]					0.937836
2	X_1	-3.300956	-0.022050 (0.754341) [-0.080098]	2.287428 (9.098523) [1.582629]	0.002575 (4.085489) [0.618232]				0.968172
3	X_1	-1.791018	-0.019006 (0.473239) [-0.069041]	1.611643 (6.807992) [1.115066]		0.000815 (1.247902) [0.150421]			0.939872
4	X_1	-3.187724	-0.017132 (0.510617) [-0.062330]	2.246499 (7.834005) [1.554311]	0.002514 (3.728018) [0.603571]		-0.002851 (0.330882) [-0.022567]		0.966263
5	X_1	-1.516001	-0.003421 (0.076505) [0.012426]	1.522599 (5.806889) [1.053458]		0.000708 (1.053916) [0.130737]	-0.009355 (0.827317) [-0.074063]		0.938623
6	X_1	-3.351523	- .027060 (.949609) [- .098298]	2.229092 (9.039527) [1.542268]	.002971 (4.443478) [.713380]			.006836 (1.445193) [.168863]	0.970230
7	X_1	-3.349461	- .027019 (.914430) [- .098152]	2.225499 (7.398420) [1.539782]	.002960 (3.494606) [.710733]	.000024 (.022450) [.004463]		.006992 (.824206) [.172728]	0.968070
8	X_1	-3.146862	- .018620 (.550778) [- .067639]	2.134258 (6.118743) [1.476654]	.002830 (3.146873) [.679432]	.000134 (.120137) [.024733]	- .004953 (.560294) [- .039212]	.008148 (.911346) [.201280]	0.966396

(Continued on next page.)

Table 7 continued.

a/ Specification of variables:

X_1 = F.o.b. prices of canned tomatoes (standard No. 2), dollars per dozen (Table 1, column 1).

X_2 = California canners' pack and movement of canned tomatoes, millions of actual cases (Table 1, column 2).

X_3 = Index of United States disposable personal income, 1947-1949=100 (Table 4, column 4).

X_4 = Adjusted index of competing canned vegetable prices, 1947-1949=100 (Table 4, column 5).

X_5 = Adjusted index of competing tomato product prices, 1947-1949=100 (Table 6, column 4).

X_6 = Other states' movements of canned tomatoes, millions of actual cases (Table 1, column 6).

t = Linear time trend, origin at 1925-26.

Where I represents:

I_1 = Annual income in dollars received (estimated net, all) children from wives (wives 1: values 1)

I_2 = Capital-turn earnings, loans and borrowings in current currency, multiplied by annual index (wives 1: values 5)

I_3 = Income of private spirits alcoholic personal finance, fixed-inflation (index 1: values 0)

I_4 = Wholesale index to reciprocal income adjusted Market Last-Inflation (wives 1: values 3)

I_5 = Wholesale index to reciprocal income adjusted fixed-inflation (wives 1: values 4)

I_6 = Gross domestic product to personal consumption, multiplied by annual index (wives 1: values 6)

I_7 = Index of gross domestic product, fixed-inflation (wives 1: values 7)

TABLE 8

California Canned Tomatoes
Multiple Regression (Least Squares) Equations and Auxiliary Statistics
(1926-27 to 1951-52, Excluding 1941-42 to 1946-47)

Equation number	Dependent variable	Constant	Independent variables[a/]						$\bar{R}$
			$\text{Log}_{10}X_2$	$\text{Log}_{10}X_3$	$\text{Log}_{10}X_4$	$\text{Log}_{10}X_5$	$\text{Log}_{10}X_6$	t	
			t-ratios in parentheses and beta coefficients in brackets						
1	Log X_1	.938861	- .123181 (.899562) [- .135641]	.671878 (5.916265) [1.169993]				- .002327 (.897784) [- .144713]	.929777
2	Log X_1	- .017636	- .122971 (.955488) [- .135409]	.691476 (6.443631) [1.204121]		.379753 (1.764360) [.476464]		.004522 (.986560) [.281138]	.938240
3	Log X_1	-1.434735	- .144023 (1.377341) [- .158591]	1.089394 (7.444631) [1.897046]	.708977 (3.539204) [1.061475]			.003547 (1.374396) [.220567]	.959807
4	Log X_1	1.148940	- .072036 (.457858) [- .079322]	.627047 (4.745433) [1.091926]			-.137340 (.697410) [-.071436]	- .001697 (.609326) [- .105541	.927363

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X_1 = F.o.b. prices of canned tomatoes (standard No. 2), dollars per dozen (Table 1, column 1).
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X_5 = Adjusted index of competing tomato product prices, 1947-1949=100 (Table 6, column 4).
X_6 = Other states' movements of canned tomatoes, millions of actual cases (Table 1, column 6).
t = Linear time trend, origin at 1925-26.